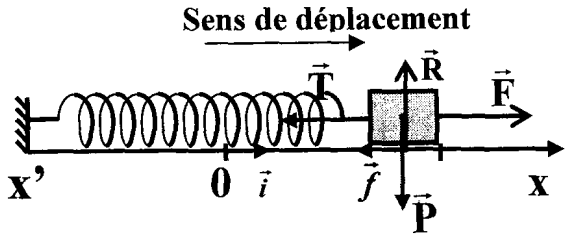
$$\frac{dE}{dt} = mva + kxv = v(ma + kx) = v(F - hv) = 0$$

$\Rightarrow$ E est constante

Exercice N°6 :

1°)



Système (solide)

RFD : $\vec{P} + \vec{R} + \vec{T} + \vec{f} + \vec{F} = m.\vec{a}$

Proj : $-kx - hv + F = m.a \Rightarrow ma + hv + kx = F$

$$\Rightarrow m\frac{d^2x}{dt^2} + \frac{hdx}{dt} + kx = F \Rightarrow \frac{mdv}{dt} + hv + kfvdt = F$$

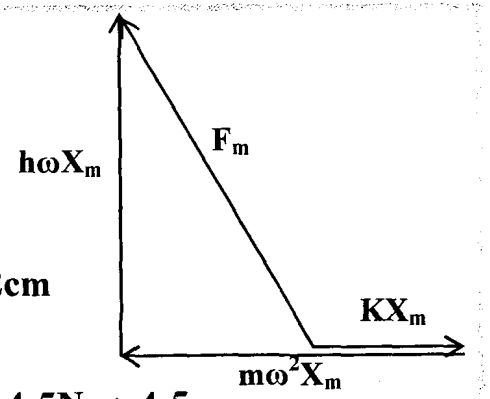
2°) $x(t) = X_m \sin(\omega t + \varphi_x)$

$$\Rightarrow x(t) = 5.10^{-2}.\sin\left(30t - \frac{2\pi}{3}\right)$$

$$\omega = 30 rad.s^{-1} > \omega_0 = \sqrt{\frac{k}{n}} = 20 rad.s^{-1}$$

$$\varphi_F - \varphi_x = \frac{2\pi}{3} = 120°$$

$$\varphi_F - \varphi_x > \frac{\pi}{2}$$



Echelle $1N \rightarrow 1cm$

$kX_m = 40.510^{-2} = 2N \rightarrow 2cm$

$F_m = ?$

$m\omega^2 X_m = 0,1.30^2.510^{-2} = 4,5N \rightarrow 4,5cm$

$\varphi_F - \varphi_x = 120°$

a- $F_m \rightarrow 5cm \Rightarrow F_m = 5N$

b- $h\omega X_m \rightarrow 4,5cm \Rightarrow h\omega X_m = 4,5N \Rightarrow h = \frac{4,5}{30.510^{-2}} = 3kg.s^{-1}$

c- $T(t) = -Kx(t) = -kX_m \sin(\omega t + \varphi_x) = 2\sin\left(30t - \frac{2\pi}{3} + \pi\right)$

$= 2\sin\left(30t + \frac{2\pi}{3}\right)$ en N

$f(t) = -hv(t) = -hX_n \omega \cos(\omega t + 6x) = -4,5\cos\left(30t - \frac{2\pi}{3}\right)$ en N

3°)

a-T en quadrature avance % à F

$$\varphi_T - \varphi_F = \frac{\pi}{2}$$

Or $T = -kx \Rightarrow \varphi_T = \varphi_x + \pi$